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SPECIFICATION FOR TUBULAR NYLON WEBBING FOR AEROSPACE PURPOSES

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Indian Standard

SPECIFICATION FOR TUBULAR NYLON WEBBING FOR AEROSPACE PURPOSES

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SPECIFICATION FOR TUBULAR NYLON WEBBING FOR AEROSPACE PURPOSES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 June 1979, after the draft finalized by the Textile Materials for Aerospace Purposes Sectional Committee had been approved by the Textile Division Council.

0.2 This standard is based on MIL-W-5625 G 'Military Specification for webbing, textile, nylon, tubular' issued by the Ministry of Defence, United States of America.

0.3 To familiarize the industry with International System units (SI units), the basic as well as the recommended SI Units for use in the textile industry are given in Appendix A.

0.3.1 Standards of Weights and Measures Act, 1976 also stipulates use of SI Units.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers six types of tubular nylon webbing generally used in fabrication of parachutes and retarding chutes. The widths covered are 13·0, 14·5, 16·0, 19·0, 22·0 and 25·5 mm.

2. MATERIAL

2.1 The nylon yarn used in the manufacture of the webbing should be bright, light and heat-resistant, and of high tenacity. The universal count of single yarn should be 93 ± 5 tex (840 ± 43 denier). The twist in the final yarn when removed from the webbing shall be not less than 100 turns per decimetre. Chrome dyes shall not be used since they have a tendency to deteriorate the life of the nylon webbing [*see* IS: 4472 (Part III)-1973*].

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*Rules for rounding off numerical values (*revised*).

2.1.1 The count and twist of the yarn may be tested by the methods given in IS : 3442-1966† and IS : 832-1964‡ respectively.

3. REQUIREMENTS

3.1 The webbing shall meet the physical requirements given in Table 1.

3.2 Identification of Webbing — The colour of identification yarns shall be yellow for white webbing and black for the coloured one. The placement of identification yarns shall be in the following order:

Type(s) of Webbing	*Identification Yarn*
I, IV and VI	Single identification yarn woven in the centre, on one side only
II	Three identification yarns woven on the face, one in the center and the other two 10 ends away from the centre
III	Two identification yarns separated by 3 face warp yarns located in the centre on the face

3.2.1 For Type V webbing, no identification yarn may be used.

3.2.2 The identification yarn shall not form puckers or loops.

3.3 The chemical requirements of the webbing are given in Table 2.

3.4 In respect of requirements not covered in this standard the tubular webbing shall not be inferior to the sealed sample agreed to in the contract or order.

4. PACKING

4.1 The webbing shall be supplied wound on spools in lengths as given in col 2 of Table 1.

NOTE — Normally the gross mass of each spool should be around 6 kg.

4.1.1 The number of short-length pieces, each measuring 20 m, *Min*, shall not exceed four per spool.

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*Methods for identification of application classes of dyes on textile materials: Part III Man-made fibres.

†Method for determination of crimp and count of yarn removed from fabrics.

‡Method for determination of twist in yarn.

TABLE 1 PHYSICAL REQUIREMENTS OF TUBULAR NYLON WEBBING

(*Clauses* 3.1 *and* 4.1)

TYPE	WIDTH	LENGTH	THICKNESS, *Max*	ENDS IN FULL WIDTH, *Min*	PICKS/cm, *Min*	MINIMUM NUMBER OF FOLDS IN FINAL YARN		MASS, *Max*	BREAKING LOAD ON 20 cm TEST LENGTH, WARPWAY, *Min* (*see* NOTE 1)	WEAVE	SHRINKAGE, WARPWAY
						Warp	Weft				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	mm ± 1·5	m/spool	mm					g/m	kN (kgf)		
I	13·0	350 to 360	2·3	111	10	1	1	16	4·5 (460)	Plain, tubular	2 percent, *Max*
II	14·5	280 to 290	2·3	137	10	1	1	19	6·7 (680)		
III	16·0	225 to 235	2·5	89	10	2	2	24	10·0 (1 020)		
IV	19·0	170 to 180	3·0	109	10	2	2	31	10·2 (1 045)		
V	22·0	135 to 145	3·0	121	10	2	1	42	13·8 (1 400)		
VI	25·5	110 to 120	3·0	159	10	2	2	53	17·8 (1 815)		
METHOD OF TEST	IS : 1954-1969*		IS : 7702-1975†	IS : 1963-1969‡		Visual		IS : 1964-1970§	IS : 1969-1968‖	—	IS : 2977-1964¶

NOTE 1 — The test specimens for breaking load shall be tested after conditioning for 48 hours in standard atmosphere (65 ± 2 percent relative humidity and 27 ± 2°C temperature).

NOTE 2 — Type VI is used in retarding chutes while other types are used in parachutes.

*Methods for determination of length and width of fabrics (*first revision*).

†Method for determination of thickness of woven and knitted fabrics.

‡Methods for determination of threads per decimetre in woven fabrics (*first revision*).

§Methods for determination of weight per square metre and weight per linear metre of fabrics (*first revision*).

‖Method for determination of breaking load and elongation at break of woven textile fabrics (*first revision*).

¶Method for determination of dimensional changes of woven fabrics (other than wool) on soaking in water.

TABLE 2 CHEMICAL REQUIREMENTS OF TUBULAR NYLON WEBBING

(*Clause* 3.3)

SL No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST
(1)	(2)	(3)	(4)
i)	Colour fastness to:		
	a) light	5 or better	IS : 2454-1967*
	b) washing	4 or better	IS : 3417-1966†
ii)	Colour matching against sealed sample agreed to in contract or order	The dyed webbing shall compare favourably	The specimens shall be tested under natural (north sky) daylight or artificial daylight at 7 500° K or incandescent lamp light at 2 800°K
iii)	Ageing test	The loss in breaking load shall not exceed 25 percent	Appendix D of IS : 4727-1968‡ (*see also* Note 1 in Table 1)
iv)	Resistance to heat	The loss in breaking load shall not exceed 25 percent	After conditioning in oven at 180 ± 3°C for one hour the breaking load shall be determined as given in IS : 1969-1968§ (*see also* Note 1 in Table 1)

*Method for determination of colour fastness of textile materials to artificial light (xenon lamp).

†Method for determination of colour fastness of textile materials to washing: Test 5.

‡Specification for nylon webbing for aeronautical purposes.

§Method for determination of breaking load and elongation at break of woven textile fabrics (*first revision*).

5. MARKING

5.1 Each spool of webbing shall have a label securely attached, on which the following information shall be legibly marked:

- a) Type;
- b) Length (m), width (mm) and thickness (mm);
- c) Net mass (kg); and
- d) Date of manufacture.

5.1.1 Each spool may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6. PACKING

6.1 A suitable number of spools shall be arranged in the form of cylindrical bundles and secured by jute twine to form a pack. A suitable number of such packs shall be arranged and wrapped with polyethylene film (*see* IS : 2508-1977*). The wrapped bundles shall be placed in a wooden packing case previously lined with one layer of waterproof packing paper (*see* IS : 1398-1968†). The voids in the case, if any, shall be stuffed with cushioning material to avoid damage in transit. The case shall be bound by iron hoops or wires.

7. SAMPLING

7.1 Lot — The quantity of tubular nylon webbing of the same type and delivered in the same consignment shall constitute a lot.

7.2 Unless otherwise specified in the contract or order, the sampling plan given in Table 3 shall be followed.

TABLE 3 SAMPLE SIZE AND PERMISSIBLE NUMBER OF DEFECTIVE SPOOLS

(*Clauses* 7.2 *and* 7.3)

LOT SIZE (NO. OF SPOOLS)	SAMPLE SIZE FOR NON-DESTRUCTIVE TESTS	PERMISSIBLE NO. OF DEFECTIVE SPOOLS	SAMPLE SIZE FOR DESTRUCTIVE TESTS
(1)	(2)	(3)	(4)
Up to 51	8	0	3
51 ,, 150	13	0	4
151 ,, 300	20	1	5
301 ,, 500	32	1	7
501 and above	50	2	10

NOTE — ' Indian Standard sampling inspection and testing scheme for aerospace textile materials ' is under preparation.

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*Specification for low density polyethylene films (*first revision*).

†Specification for packing paper, waterproof, bitumen-laminated (*first revision*).

7.3 The criteria for conformity for various characteristics shall be as given below:

Characteristics	*Criterion for Conformity*
a) Length, width, thickness, ends and picks	Permissible number of non-conforming rolls shall not exceed the corresponding number given in col 3 of Table 3
b) Mass and shrinkage	The value of the expression 'Mean + 0·6 Range' shall not exceed the corresponding limit
c) Breaking load, ageing and resistance to heat	The value of the expression 'Mean — 0·6 Range' shall not fall below the corresponding limit
d) Colour fastness and colour matching	All the test specimens shall satisfy the specified requirements

APPENDIX A

(*Clause* 0.3)

SI UNITS

TABLE 4 INTERNATIONAL SYSTEM UNITS

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

TABLE 5 RECOMMENDED SI UNITS FOR TEXTILES

SL No.	CHARACTERISTIC	SI UNITS		APPLICATION
		Unit(s)	Abbreviation(s)	
(1)	(2)	(3)	(4)	(5)
1)	Length	Millimetre	mm	Fibres
		Millimetre, centimetre	mm, cm	Samples, test specimens (as appropriate)
		Metre	m	Yarns, ropes, cordages, fabrics
2)	Width	Millimetre	mm	Narrow fabrics
		Centimetre	cm	Other fabrics
		Millimetre, centimetre	mm, cm	Samples, test specimen (as appropriate)
		Centimetre, metre	cm, m	Carpets, druggets, *DURRIES* (as appropriate)
3)	Thickness	Micrometre (micron)	µm	Delicate fabrics
		Millimetre	mm	Other fabrics, carpets, felts
4)	Linear density	Tex	tex	Yarns
		Millitex	mtex	Fibres
		Decitex	dtex	Filaments, filament yarns
		Kilotex	ktex	Slivers, ropes, cordages
5)	Diameter	Micrometre (*micron*)	µm	Fibres
		Millimetre	mm	Yarns, ropes, cordages
6)	Circumference	Millimetre	mm	Ropes, cordages
7)	Threads in fabric:			Woven fabrics (as appropriate)
	a) Lengthwise	Number per centimetre	ends/cm	
		Number per decimetre	ends/dm	
	b) Widthwise	Number per centimetre	picks/cm	
		Number per decimetre	picks/dm	
8)	Warp threads in loom	Number per centimetre	ends/cm	Reeds
9)	Stitches in the knitted fabric:			Knitted fabrics (as appropriate)
	a) Lengthwise	Courses per centimetre	courses/cm	
		Courses per decimetre	courses/dm	
	b) Widthwise	Wales per centimetre	wales/cm	
		Wales per decimetre	wales/dm	

(*Continued*)

TABLE 5 RECOMMENDED SI UNITS FOR TEXTILES — *Contd*

SL No.	CHARACTERISTIC	SI UNITS		APPLICATION
		Unit(s)	Abbreviation(s)	
(1)	(2)	(3)	(4)	(5)
10)	Stitch length	Millimetre	mm	Knitted fabrics Made-up fabrics
11)	Mass per unit area	Grams per square metre	g/m^2	Fabrics
12)	Mass per unit length	Grams per metre	g/m	Fabrics
13)	Twist	Turns per centimetre Turns per metre	turns/cm turns/m	Yarns, ropes (as appropriate)
14)	Test or gauge length	Millimetre, centimetre	mm, cm	Fibre, yarns and fabric specimens (as appropriate)
15)	Breaking load	Millinewton	mN	Fibres, delicate yarns (individual or skeins)
		Newton	N	Strong yarns (individual or skeins), ropes, cordages, fabrics
16)	Breaking length	Kilometre	km	Yarns
17)	Tenacity	Millinewton per tex	mN/tex	Fibres, yarns (individual or skeins)
18)	Twist factor or twist multiplier	Turns per centimetre × square root of tex Turns per metre × square root of tex	$\text{turns/cm} \times \sqrt{\text{tex}}$ $\text{turns/m} \times \sqrt{\text{tex}}$	Yarns (as appropriate)
19)	Bursting strength	Newton per square centimetre	N/cm^2	Fabrics
20)	Tear strength	Millinewton Newton	mN N	Fabrics (as appropriate)
21)	Pile height	Millimetre	mm	Carpets
22)	Pile density	Mass of pile yarn in grams per square metre per millimetre pile height	g/m^2/mm pile height	Pile carpets
23)	Elastic modulus	Millinewton per tex per unit deformation	mN/tex/unit deformation	Fibres, yarns, strands

INDIAN STANDARDS ON TEXTILE MATERIALS FOR AEROSPACE PURPOSES

IS:	
514-1978	Mercerized cotton fabrics for covering aircrafts and gliders (*second revision*)
714-1979	Cotton reinforcing tape for aerospace purposes (*second revision*)
1376-1979	Cotton sewing threads for aerospace purposes (*second revision*)
1402-1979	Braided cotton cord for aerospace purposes (*first revision*)
2196-1966	Linen sewing thread for aeronautical purposes (*revised*)
2197-1962	Braided (plaited) linen cord for aeronautical purposes
2198-1971	Flax webbing for aeronautical purposes (*first revision*)
2965-1964	Breaking cord for cotton parachutes
2970-1964	Cotton fabrics for supply-dropping parachutes
2971-1964	Cotton fabric for target sleeves
3243-1965	Nylon fabric for man-dropping parachutes
3244-1965	Cotton webbing, statichute
3255-1979	Scoured or dyed cotton tapes for aerospace purposes (*first revision*)
3449-1979	Cotton webbing for parachutes (*first revision*)
3846-1966	Rot-proofed cotton tapes for aeronautical purposes
4227-1967	Braided nylon cord for aeronautical purposes
4228-1979	Nylon tapes for aerospace purposes (*first revision*)
4229-1978	Nylon sewing threads for aerospace purposes (*first revision*)
4437-1973	Braided nylon cord for personnel parachutes (*first revision*)
4719-1979	Wire-woven rayon fabric for aerospace purposes (*first revision*)
4726-1968	Light-weight nylon fabric for personnel parachutes
4727-1968	Nylon webbing for aeronautical purposes
5010-1969	Nylon fabric for heavy supply-dropping parachutes
5304-1969	Nylon fabric for sea-mine parachutes
5716-1970	Cotton tapes for personnel parachutes
5746-1970	Finished woven glass fibre fabrics for plastic laminates for aeronautical purposes, Type 1
6349-1971	Tubular woven nylon tape
6879-1973	Fabric for target banner, radar responsive
6900-1973	Proofed nylon leno fabric
8947-1978	Material (nylon webbing) for aircraft safety belts
9267-1979	Tubular nylon webbing for aerospace purposes